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line 36 and line 55; column 12, lines 52-55; column 13, lines 50-51; and many others.) This means that Burke is trying to avoid any change in the substrate grains near the bond. Burke is attempting to achieve the condition of FIG. 1 of the present invention wherein the grains 20 of the substrate grow into the bond, and he is trying to avoid the growth of new grains in the bond region as illustrated in FIG. 2 of the present invention. This is especially important to Burke for single crystal applications wherein the new grains produced by recrystallization defeat the advantages of the single crystal material.

Burke teaches that stored cold work (i.e. residual stress) in the substrate material is one of the factors that can stimulate recrystallization during the bonding process. (See column 13, lines 51-54). Burke teaches that the mechanical processes that are used to clean and to reshape the substrate surfaces must be carefully controlled because mechanical damage induced by such processes can cause recrystallization. (See column 13, line 58-59). Thus, Burke "mandates low stress cleaning." (Quoting from column 14, line 35.)

By contrast, the present invention requires an elevated level of stress in the substrate prior to bonding, and the present invention encourages recrystallization so that grains nucleating in the molten region of the insert during bonding grow into the substrate to a size exceeding a thickness of the molten region. Thus, Burke is strongly teaching away from the presently claimed invention.

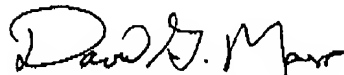
Burke typifies the prior art processes described in the Background section of the present application at page 2, lines 21-28. Such processes minimize the residual stress in the substrate surface, for example by the use of low stress grinding and electro- processes. Burke recommends low stress grinding at column 12, line 48, and he recommends electro-discharge machining at column 13, line 2. Burke mandates such low stress processes because "Such ground surfaces do not contain sufficient stored plastic work to cause recrystallization in the near surface region. " (Quoting from column 12, lines 52-54) This teaches away from the present invention which claims (using the language of claim 10 as an example) a process that cold works the substrate surface "to a degree sufficient to cause the joint grains to recrystallize and grow into the substrate."

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Burke characterizes recrystallization as "deleterious." (See column 13, line 50.) This is typical of the thinking of the prior art because the bond grains of the prior art were limited to the thickness T of the molten region, as illustrated in FIG. 2 of the present invention. The present inventors have realized that an improved process can be achieved by inducing sufficient cold working into the substrate surface so that the bond grains actually continue to grow into the substrate, thus making it possible to achieve a stronger bond joint.

Thus, Burke clearly teaches away from the present invention and does not support any of the claim rejections under 35 USC 102 or 103. Reconsideration of the application in light of the above Remarks and allowance of claims 1-18 are respectfully requested.

Respectfully submitted,



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